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Publication date:
2012

Document Version
Publisher's PDF, also known as Version of record

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COMPARISON OF THE PATHOGENICITY OF TWO SEROTYPE O FOOT-AND-MOUTH DISEASE VIRUSES (CHIMERIC AND FIELD STRAIN VIRUSES) IN PIGS

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Introduction

The surface exposed capsid proteins of foot-and-mouth disease virus (FMDV) determine its antigenicity and the ability of the virus to interact with the host cells. The use of viruses with identical capsid sequences allows the role of sequences outside of this region in pathogenicity to be determined. In the present study we compared the pathogenicity of chimeric (O1K/O-UKG) and field strain (O-UKG/34/2001) viruses in young pigs.

Materials and Methods

Seven-week-old pigs were exposed to virus, either by inoculation or contact. One group of pigs was exposed to the O1K/O-UKG chimera, a derivative of the cell culture adapted O1K B64 strain with the surface exposed capsid proteins (VP1, VP2 and VP3) from O UKG/34/2001 and a second group of pigs was exposed to the field strain O UKG/34/2001. All pigs were examined for clinical signs of FMD and rectal body temperatures were recorded daily. Blood samples were collected on selected days during the experiment and heart tissue was collected post mortem.

fig. 1A+B

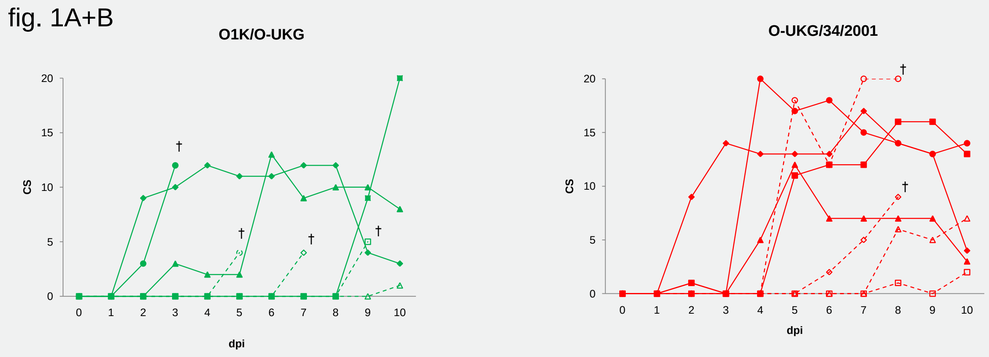

Figure 1A+B: Clinical scores (CS) for individual pigs. A CS was assigned to each animal based on 4 FMD-relevant parameters: 1) Well-being: 0=normal, 1=depressed; 2) appetite: 0=normal, 1=suppressed; 3) mobility: 0=free movement, 1=lame, 2=recumbent; 4) lesions on mouth/nose/tongue/feet (all 4 feet individually scored): 0=no lesion, 1=elevated temperature in local area/congestion/healing vesicle, 2=vesicle, 3=ruptured vesicle, severe lesion, in total giving a score between 0 and 25. Inoculated pigs= filled symbols and solid lines, in-contact pigs= open symbols and dotted lines.

fig. 2A+B

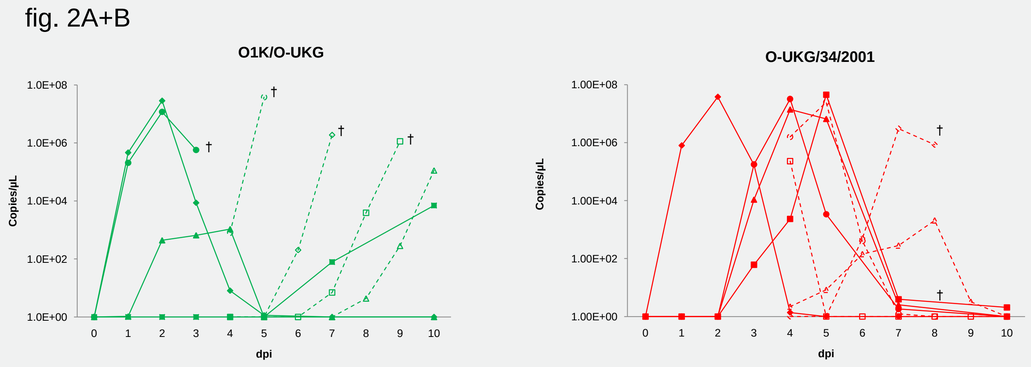

Figure 2A+B: Viral RNA in serum, individual pigs, measured by qRT-PCR expressed as copies of FMDV genome/µl of serum. Inoculated pigs= filled symbols and solid lines, in-contact pigs= open symbols and dotted lines. Blood samples were collected on PID 0, 1, 2, 3, 4, 5, 7 and 10 for inoculated pigs and on PID 0, 4, 5, 6, 7, 8, 9 and 10 for contact pigs. † indicates death or euthanasia for welfare reasons.

Results

All pigs infected with the O1K/O-UKG chimera or the field strain (O-UKG/34/2001) developed fulminant disease (fig. 1) and showed a high level of viral RNA in serum (fig. 2). The pigs that survived the acute phase of infection developed a serotype specific antibody response. However, 4 of the pigs exposed to the O1K/O-UKG chimeric virus died in the acute phase of infection. High levels of viral RNA were found in the hearts of these pigs (fig. 3). Furthermore 2 pigs exposed to O-UKG/34/2001 field strain virus had to be euthanized for welfare reasons.

Discussion

In this study we saw acute deaths in young pigs exposed to the O1K/O-UKG chimera. Four out of 8 pigs were found dead in the pen shortly after initial clinical signs were recorded. Whether this finding was related to the differences between the two viruses (outside of the capsid coding region) or coincidental is not yet clarified.

fig. 3

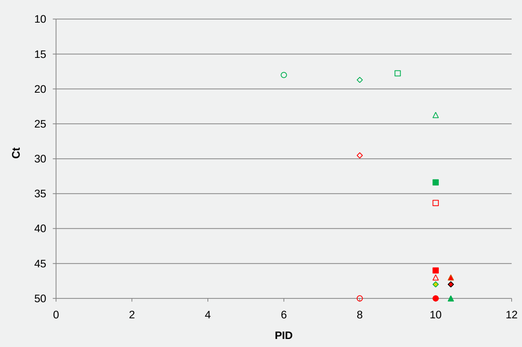

Figure 3: Viral RNA in heart tissue of individual pigs, measured by qRT-PCR expressed as threshold cycle (Ct) values. Inoculated pigs= filled symbols and solid lines, in-contact pigs= open symbols and dotted lines. Green symbols = pigs exposed to O1K/O-UKG, red symbols = pigs exposed to O-UKG/34-2001.

Reference:

Lohse L, Jackson T, Bøtner A, Belsham GJ. Capsid coding sequences of foot-and-mouth disease viruses are determinants of pathognicity in pigs. Vet Res 2012, 43:46